

Vector Arithmetic (Section Formula)

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Question:

Show that the points **A** $(-6, 10)$, **B** $(-4, 6)$ and **C** $(3, -8)$ are collinear and prove that $AB = \frac{2}{9}AC$.

Solution:

If the determinant $\begin{pmatrix} 1 & 1 & 1 \\ A & B & C \end{pmatrix}$ is zero, then A , B , and C are collinear.

$$\text{Det} = \begin{vmatrix} 1 & 1 & 1 \\ -6 & -4 & 3 \\ 10 & 6 & -8 \end{vmatrix} \quad (1)$$

$$= 1 \cdot (32 - 18) - 1 \cdot (48 - 30) + 1 \cdot (-36 + 40) \quad (2)$$

$$= 0 \quad (3)$$

$\therefore A$, B , and C are collinear.

Using the section formula, if B divides AC in the ratio $m : n$, then:

$$\left(\frac{m \cdot 3 + n \cdot (-6)}{m + n}, \frac{m \cdot (-8) + n \cdot 10}{m + n} \right) = (-4, 6) \quad (4)$$

Equating the coordinates, we get

$$\frac{m}{n} = \frac{2}{7} \quad (5)$$

\therefore It confirms that B divides AC in the ratio $2 : 7$. Since B divides AC in the ratio $2 : 7$, we have:

$$\frac{AB}{AC} = \frac{2}{2+7} = \frac{2}{9} \quad (6)$$

$\therefore AB = \frac{2}{9}AC$, Hence proved.

